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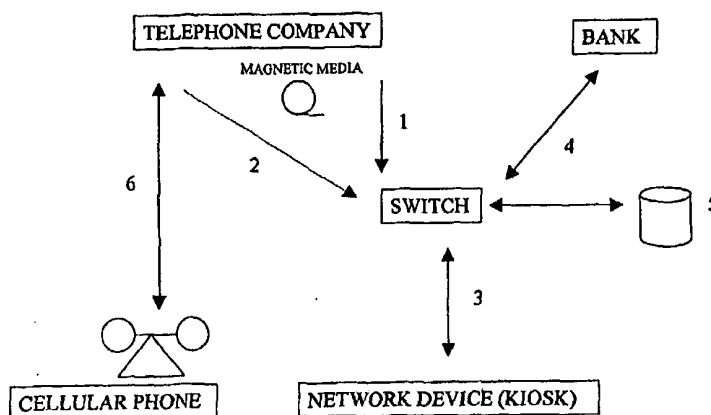
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(54) Title: METHOD FOR ELECTRONICALLY VENDING, DISTRIBUTING, AND RECHARGING OF PRE-PAID VALUE, A VENDING MACHINE AND AN ELECTRONIC SYSTEM FOR USE THEREIN

ELECTRONIC SALE OF PREPAID

(57) Abstract

The invention provides for a method, a network device and a network for electronically vending pre-paid values such as cellular air time, the method including the steps of offering pre-paid values for sale to a purchaser on an electronic network, the network enabling communication electronically between the purchaser, an independent financial institution and computerised managing means for managing the sale of pre-paid values; requesting a specific pre-paid value from the managing means; making payment; transmitting payment data to the managing means so as to credit the beneficiary account; and providing the purchaser with reference detail about the pre-paid value purchased.

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METHOD FOR ELECTRONICALLY VENDING, DISTRIBUTING, AND RECHARGING OF PRE-PAID VALUE, A VENDING MACHINE AND AN ELECTRONIC SYSTEM FOR USE THEREIN.

Field of the Invention

- 5 This invention relates to a method for electronically vending, distributing, recharging and/or replenishing pre-paid value, and a vending machine as well as a network for use therein.

Background of the Invention

- 10 The development of technology and the ability of technologically advanced equipment to operate with various types of tokens with specific monetary or pre-paid value as well as the ability to vend such tokens by means of vending machines to date have been hampered by the use of physical tokens and cash payments.

- 15 The cost and/or time required to service and/or stock vending machines, although certain vending machines have been provided with land-line modem facilities to facilitate control, stocktaking and/or auditing, have further hampered the development of technology and the ability of equipment to operate with pre-paid tokens.

The lack of national electronic networks suitable to provide the coverage required to use such networks for prepaid national services, also hampered the development of technology and the ability of equipment to operate with pre-paid tokens.

5 Object of the Invention

It is an object of the present invention to provide a novel method of electronically vending, distributing, recharging and/or replenishing pre-paid value and a vending machine for use in such method.

Summary of the Invention

- 10 According to a first aspect of the invention there is provided a method for electronically vending pre-paid value including the steps of offering pre-paid values for sale to a purchaser on an electronic network, the network enabling communication electronically between the purchaser, an independent financial institution and computerised managing means
- 15 for managing the sale of pre-paid values;
requesting a specific pre-paid value from the managing means;
making payment;
transmitting payment data to the managing means so as to credit the

beneficiary account; and

providing the purchaser with reference detail about the pre-paid value purchased.

The method may include a preliminary step of providing the
5 computerised managing means with a stock of Personal Identity
Numbers ("PIN"s), preferably in file form via magnetic media,
alternatively, via a network link.

The step of making payment may be by way of cash payment,
alternatively, by way of bank card or pre-registered banking account
10 relationship.

According to a second aspect of the invention there is provided
a method for electronically distributing pre-paid value including the steps
of offering pre-paid values for distribution to a retailer on an electronic
network, the network enabling communication electronically between the
15 retailer and computerised managing means for managing the distribution
of pre-paid value;
requesting a specific pre-paid value from the managing means;
means for managing the replenishment of pre-paid values;
making payment;

transmitting payment data to the managing means so as to credit the beneficiary account; and

providing the retailer with reference detail about the prepaid value distributed.

- 5 According to a third aspect of the invention there is provided
a method for electronically recharging pre-paid values comprising the
method for electronically selling pre-paid value substantially as
hereinbefore defined, characterized in including the steps of requesting
a recharge in accordance with a specific pre-paid value purchased; and
10 providing the purchaser with reference detail about the specific value
recharged.

- According to a fourth aspect of the invention there is provided
a method for replenishing a chip card with a pre-paid value including the
steps of offering pre-paid values for replenishment to a purchaser on an
15 electronic network, the network enabling communication electronically
between the purchaser, an independent financial institution and
computerised managing means for managing the replenishment of pre-
paid values;
requesting a specific pre-paid value from the managing means;
20 making payment;

transmitting payment data to the managing means so as to credit the beneficiary account;

transmitting a recharge instruction with recharged value to the purchaser; and

5 providing the chip card to be replenished with such replenishment.

According to a fifth aspect of the invention there is provided a method for electronically vending pre-paid values via the Internet, the method comprising the method of electronically vending pre-paid values substantially as hereinbefore defined, characterised in including the step
10 of pre-registering the network device, the customer and the managing means in accordance with SET and SSL protocols.

According to a sixth aspect of the invention there is provided a method for electronically recharging pre-paid values via the Internet, the method comprising the method of electronically vending pre-paid
15 values via the Internet, substantially as hereinbefore defined, characterised in including the steps of requesting a recharge in accordance with a specific pre-paid value purchased; and providing the purchaser with reference detail about the specific value recharged.

The pre-paid values sold, distributed, recharged and/or replenished may be pre-paid cellular airtime.

According to a seventh aspect of the invention there is provided
a network device for use in a method for vending, distributing ,
5 recharging and/or replenishing pre-paid values electronically, the network
device comprising a vending machine having a traditional computer
driven electronic display monitor;
a traditional computer driven printer;
a keyboard, capable of capturing security codes from purchasers in
10 support of banking cards;
note acceptor means for optically recognizing bank notes and
determining the monetary value thereof;
processing means for electronically driving the hardware and software
incorporated in the vending machine required to facilitate the processing
15 of an electronic transaction; and
card reader means for reading the magnetic strip, of banking cards to be
used for providing payment, and the computer chips.

According to an eighth aspect of the invention there is provided an
electronic system for vending, distributing, recharging and/or
20 replenishing pre-paid value electronically, the system comprising

a network device, being substantially as hereinbefore defined;

an electronic network, including at least one of the digital communication facilities presently available such as radio, satellite and landline telecommunication;

- 5 computerised managing means for electronically managing the network, the PIN storage and transfer, data distribution, financial procedures and security procedures; and

an independent financial institution for electronically distributing, managing and collecting funds.

10 Description of the Diagrams

Preferred embodiments of the invention shall now be described by means of non-limiting examples only and with reference to the accompanying diagrams wherein :

- Diagram 1 is a schematic layout of an electronic sale of pre-paid cellular
15 airtime;

Diagram 2 is a schematic layout of an electronic distribution of pre-paid cellular airtime;

Diagram 3 is a schematic layout of an electronic recharge of pre-paid cellular airtime;

Diagram 4 is a schematic layout of an electronic chip card replenishment of pre-paid value for call box users; and

- 5 Diagram 5 is a schematic layout of an electronic sale and an electronic recharge via the Internet of pre-paid cellular airtime.

Detailed Description of the Diagrams

1. Electronic Sale : (Diagram 1)

10 The electronic re-sale has four components that are required to effect the sale of the pre-paid value. The components are :

15 The Network Device : This is a device that is attached to a network and consists of a screen, printer, secure keyboard, note acceptor, processor and card reader capable of reading magnetic stripe cards as well as communicating with a chip card and PC multimedia components. The device provides the point of interaction for the customer and uses these devices to effect the sale :

The screen is a traditional computer driven electronic display monitor that will vary in accordance with the system configuration put in place.

The printer is a traditional computer driven printer.

5 The secure keyboard provides the capability of capturing security codes from customers in support of banking cards and other such identification products.

10 The note acceptor is a device which can optically recognise a bank note and in doing so determine the value of the note. This facility is required for cash payments.

The processor is a computer chip with the capability of driving all the linked devices and running the software programme required to facilitate the processing of the electronic sale.

15 The card reader is a device that reads the magnetic stripe that is part of the plastic cards used in the banking industry. In addition to this the card reader is also capable of reading from and writing

to the computer chips that are becoming part of the banking card market.

5 Network : The networking capability is a key entity in provision of this service and consists of a number of differing technologies representing all of the digital communications facilities available today (radio and satellite as well as the traditional telecom infrastructure). This component is the carrier that links all the other components together where required.

10 Computer Managing Means ("The switch") : This is a computer that provides a number of services in the pre-paid processing cycle. The following is a breakdown of the services available via the switch :

15 Network management : the switch manages the network where it is able to consolidate the state of health of all the machines from which maintenance calls can be scheduled. In addition to managing the maintenance process on the hardware, the system also provides statistics in support of SLA management.

PIN Management : The PIN is an identification number that is unique and is used by the client to effect the recharge of the pre-paid value on completions of the sale. The switch is the custodian of all the PIN's that are stored for sale to the public. These PIN's are transported to the switch either via magnetic media or via a network link.

Distribution : The switch is the central point from which data and software are distributed to the devices attached to the network for the processing of the pre-paid value.

Financial Processing : The switch provides connectivity into the banking systems where payment for the pre-paid value is realised. Apart from the transmission of data between Cell f Service and the bank, the switch also has extensive journalising and reconciliation capabilities. These added features are a key component in the process of settlement between the bank and the parties involved in the sale of the pre-paid value.

Security Management : The switch provides for the secure management of the environment by ensuring that security

zones between the components of the system are populated with encryption keys. Apart from the distribution of the keys the system has its own encryption capability and it is able to verify that data sent and received at the switch is correct.

Financial Institution ("The Bank"): The bank is a key component in the process of selling the pre-paid value in that this is the way in which funds can be electronically distributed and managed. The bank will provide for the collection of the funds from customers (where bank cards re used) and the distribution of funds between the companies participating in the sale process.

In Diagram 1:

1 & 2 show the transfer of "PIN" files between the "PHONE COMPANY" and the "SWITCH" through either magnetic media or file transfer.

3 represents the network connection between the "KIOSK" and the "SWITCH" which is a basic

requirement for the transaction processing.

4 is the network link with the "BANK".

5

5 shows the data bases used by the "SWITCH" to store "PINS" and audit trails.

6 shows the link between the "TELEPHONE COMPANY" and "CELLULAR PHONE" which activates the recharge as the last step in this sales process.

The process of the electronic sale of pre-paid value is broken up into a number of steps. The sequence of these steps could vary and in some cases certain steps are not required but what is detailed below are the steps in a basic sales cycle:

Step 1: Pre-paid PINs are obtained from the service provider on a regular basis or when customer demands exhausts the stock on hand. The PINs are obtained from the provider in a file form and either transmitted to the

switch across the network link or delivered on magnetic media.

Step 2 : The customer initiates the transaction and requests a value recharge at one of the network devices.

5 Selecting the correct option on the interface menu of the network device starts the process. In this instance the network device can be one of a number of devices which include the kiosks, ATMs, point of sale devices and the cell phone itself. At this point communications between the
10 device and the switch will be established where they are not already in operation.

Step 3 : The customer is requested to pay for the transaction. The payment process can either be with cash where the customer will be requested to feed the cash for
15 payment into a note acceptor on the device or via a bank card/registered (either credit card, debit card, chip card or a pre-registered banking account relationship). The payment mechanism has an influence on the process employed at the point of service and the individual
20 processes are :

5 If the payment is via a bank card the customer will be requested to key in the bank PIN associated with the bank being used in the transaction. In some cases the customer will also be requested to specify the bank account which is to be debited with the costs of the transaction. In some cases the customer will also be requested to specify the bank account which is to be debited with the costs of the transaction.

10 Where a chip card electronic purse is used, the chip will be requested to authorise the transaction and if the transaction is authorised the correct value will be deducted from the chip.

15 In the cases of a personal device being the transaction medium the payment process will be via a pre-registered banking relationship unless the same technology is present as is found in the public access devices. In this case the customer will have pre-registered a personal identification object coupled with an access code (in the case of a cell phone it will be the phone number of the phone transmitted

20

from the phone as part of call liner identification and a password).

5 Step 4 : The network device will transmit the transaction date to the switch in a secure manner that makes use of industry standard encryption and macing techniques. Where the device is a personal one without the capability of encryption the data will not be secure in transit but as both the payment medium and the beneficiary are pre-registered there is no risk.

10 Step 5 : There are two basic conditions that are dealt with at the switch with respect to the banking interface. The first is the traditional banking process where either the banking card and its PIN are available or there is a pre-registered relationship between the customer and his
15 banking details and the second is where the transaction has already been authorised by a chip card. The details of the two options are :

Where the banking card or a pre-registered relationship exists, the switch will format a payment

request to the bank.

5

Where the transaction has already been approved by a chip card the message that is constructed for transmission to the bank will not be an approval request but rather information for accounting purposes.

In both situations the switch will retain audit trails of the process.

10

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Step 6 : In this step the bank will process the debiting of the customer's account. This process will, where the client is not a customer of the acquiring bank, necessitate the use of the Interbank real-time settlement mechanisms. Once the bank has satisfied itself that the payment request meets with their approval, then the customer will be debited. The funds realised from the debiting cycle will then be credited to the pre-determined beneficiary accounts that will include the account of the telephone company. Once the bank has completed the accounting process it will return either the approval or rejection notification back to the switch.

Step 7 : On receiving the response from the bank the switch will do one of two things :

5 On the receipt of a transaction rejection notification the switch will notify the network device that the transaction has been rejected, complete with explanation.

10 On the receipt of an acceptance message the switch will retrieve a PIN from the local database and forward this to the network device. Where the network device is a cell phone, the message will be forwarded using the SMS services available to the cell phones.

In both cases the system will journalise the transactions for both accounting and statistical purposes.

15 Step 8 : The network device on the receipt of the completion message from the switch will notify the customer of a rejection where the transaction cannot be successfully complete. Where the transaction can be

completed successfully the PIN number will either be displayed on the screen or printed on the receipt where a printer is present. Once the transaction is successfully completed a completion message will be generated.

5

Step 9 : The customer will activate the recharge by connecting with the telephone company and entering the PIN number received as part of the transaction.

10 2. Electronic Distribution : (Diagram 2)

This is a process that has been crated to replace the current system of scratch cards that are used in some of telephone operations where pre-paid services are used. In this service the PIN numbers from the telephone company are acquired either through magnetic means or over a digital network connection. In some cases the PIN numbers will be retained in a central database either at the switch or distributed to local databases.

15

In Diagram 2:

20

1 & 2 show the transfer of "PIN" files between the "PHONE COMPANY" and the "SWITCH" through either magnetic media or file transfer.

3 represents the network connection between the "KIOSK" and the "SWITCH" which is a basic requirement for the transaction processing. This link can be used to distribute a file of "PINS" to a local data base for local sale 7 and in some cases the "SWITCH" can become redundant with the file downloaded directly from the "TELEPHONE COMPANY" 8A, in this instance the financial transaction will be sent direct to the bank 8.

4 is the network link with the "BANK".

5 & 7 are central and distributed "PIN" data bases respectively.

6 shows the link between the "TELEPHONE COMPANY" and "CELLULAR PHONE" which activates the recharge as the last step in this sales process.

The sale at the retail outlet will either be via cash or bank card (credit card, debit card or chip card), handled by the sales assistant utilising the retail POS services. Once the sales assistant

is satisfied that payment has been received a PIN will be requested from the database and printed either on the printer of the Till or the POS device. Where the Till or POS device is attached to a network the PIN will be retrieved from the central database on the switch or from the local database. In the case where the sale is effected through a cash transaction the merchant's account will be debited at the bank with the credits being processed to the participants in the normal manner.

The process of database refreshment will in the case of the switch be the same as utilised within the electronic sales process. In the case of the distributed database it will employ the same process from the telephone company as the switch or receive a secondary distribution from the switch by either magnetic media or via a network distribution process.

On receipt of the printed PIN the customer will follow the same process as is currently in place for the scratch cards and the electronic sales process and dial the telephone company followed by an entering of the PIN to activate the recharge.

3. Electronic Recharge: (Diagram 3)

In Diagram 3:

1 is the network link over which the recharge
5 instruction to the "PHONE COMPANY" is effected.

3 represents the network connection between the
"KIOSK/P.O.S." and the "SWITCH" which is a basic
requirement for the transaction processing.

4 is the network link with the "BANK".

10 5 represents the audit trail data bases.

6 is the final step in the cycle where the
"TELEPHONE COMPANY" activates the recharge.

Electronic recharge is an extension of the electronic sales process
that takes the automation of the recharge facility to a new
15 dimension by eradicating the need for the PIN. This process
requires additional networking capability with a connection
between the switch and the telephone company. The process
changes that occur in this function over and above the function of
the electronic sales function are :

20

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The switch on receipt of the authorization from the banking system will connect to the telephone company's computer system via the network and request a recharge for other given phone number. Once the telephone company has approved and enacted the recharge it will return a positive acknowledgement to the switch. The switch will return a positive completion to the network device.

10

The network device will request that the customer capture the phone number that the recharge is requested for. The capture of this data will either be via entry on the keyboard of the device or any other input device (bar code scanner, card reader, touch screen, etc.) or where a cell phone is used via a call line identification. The network device will print a receipt for the transaction (where required) that will not include the PIN number as in the electronic process. The PIN in this instance will be replaced by a reference code for audit trail purposes.

15

20

The telephone company as the additional factor in the online recharge process will accept the request for recharge from the switch after which it will inactivate the recharge either through an automatic process in its billing system or via a SMS message to the cell phone.

4. Chip Card Replenishment: (Diagram 4)

In Diagram 4:

5 1 is the network link with the "BANK" where the request for payment is processed.

 2 is the network link for the device processing the value sale and subsequent chip card replenishment. This leg may in some cases connect direct to the "BANK" for the financial leg of the transaction 3.

10

This process has much in common with the recharge utilised for the cell phone service but is aimed at providing similar services for traditional call box users (public pay phones). As technology advances this service will be used to charge chip cards for use in other devices which include other forms of telephony, intelligent water meters, intelligent electricity meters, Internet phoner, etc. The entities utilised here include those specified in the electronic sales processes and will include an additional entity in the pay phone chip card. The process changes that will be made to the electronic sales process for this function are:

15

20

5

The switch will process the financial as with the electronic sale, but instead of transmitting the PIN number to the network device it will transmit as recharge instruction complete with the value of the recharge. The switch will have to produce settlement/reconciliation listings for the telephone company.

10

15

20

On receipt of a transaction confirmation the network device will request that the customer insert the pay phone chip card after which the device will add the pre-paid value to the resident on the card. This service can be extended to include a wide range of other pre-paid value items that include pre-paid taxi fares, pre-paid electricity, pre-paid water, etc. In these situations meters capable of reading cards carrying the value replace the pay phone. The network device will in some cases be upgraded to include a dispense option where it will dispense disposable chip cards of predetermined value. On the completion of the transaction the network device will issue a receipt where required and process a completion message back to the switch.

5. Electronic Sale Via the Internet: (Diagram 5)

In Diagram 5:

1 is the network link between the "SWITCH" and
5 the "TELEPHONE COMPANY" which is used for the
distribution of "PIN" files and where an electronic
recharge occurs the network link will be used to
process the instruction on the "TELEPHONE COMPANY".

2 is where a manual distribution of "PIN" files
10 on magnetic media is utilised.

3 is the network link that is required between
the "INTERNET SERVICE PROVIDERS" and the "SWITCH".

4 is the link between the "INTERNET DEVICES"
and the "INTERNET SERVICE PROVIDERS". In this
15 instance the device is generally owned by a customer
of the "INTERNET SERVICE PROVIDER".

5 is the network link with the "BANK" to
facilitate financial settlement.

6 and 6A are the network links between both the
20 customer and the "SWITCH" and a recognised
certification authority. The authority is the key
component of the transaction which certifies the
authenticity of both the client and the merchant (in

this case the "SWITCH").

7 is the data base where "PINS" for the
electronic sale are stored. In addition to the
5 "PINS", comprehensive audit trails are also stored.

8 is where either the customer (in the
electronic sales process) or the "TELEPHONE COMPANY"
activates the recharge completion.

The electronic sale via the Internet differs little
10 from the electronic sale already described. As this
is a customer owned network device there is more
than one option that has to be addressed. The
following are the differences to the electronic
sales process:

15 The network device and the customer are pre-
registered in accordance with the SET and SSL
protocols. As market trends change, other
newly developed security protocols will be
catered for.

20 The switch is pre-registered in accordance with
the SET and SSL protocols.

The customer has hardware security in the form
of hardware security module or a chip card

reader which enables secure communications in
either a browser based TCP/IP or proprietary
Cell f Service environment.

5

6. Electronic Recharge via the Internet : (Diagram 5)

10

This process is a combination of the electronic sales process on
the Internet as well as the standard electronic recharge. In this
instance the switch retains that network connection to the
telephone company for the auto recharge while using the system
changes detailed in the electronic sale on the Internet.

15

The services herein described are all supported by error recovery
processes allowing for the reversal of all transaction elements where
there has been a systems failure which prevents the successful
completion of the transaction.

20

It will be appreciated that many variations in detail are possible without
departing from the scope and/or spirit of the invention as claimed in the
claims hereinafter.

CLAIMS

1. A method for electronically providing pre-paid values including the steps of providing pre-paid values to purchasers by means of an electronic managing means for managing the provision of pre-paid values electronically to a network device at a point of sale on an electronic network, the network enabling communication electronically between the point of sale and the managing means; requesting a specific pre-paid value from the managing means; transmitting payment data to the managing means, enabling the managing means to credit a beneficiary account; and providing reference detail about the specific pre-paid value provided to the point of sale.
2. The method as claimed in claim 1 wherein the provision of pre-paid values is for any one of the purposes selected from the group consisting of electronic sale, electronic distribution, electronic recharge and chip card replenishment of such pre-paid values.
3. The method as claimed in claim 2 including the steps of requesting a recharge electronically in accordance with the specific pre-paid value from a service provider; and providing an acknowledgement

of the specific pre-paid value recharged to the point of sale as the reference detail.

4. The method as claimed in claim 2 including the step of inserting a chip card at the point of sale into the network device, thus
5 enabling the managing means to add the specific pre-paid value by means of the network device to a value resident on the chip card for the replenishment thereof.
5. The method as claimed in claim 2 including the step of pre-registering the network device, the purchaser and the managing
10 means in accordance with at least one of the so-called SET and SSL protocols for electronic sale via the so-called Internet.
6. The method as claimed in claim 3 including the step of pre-registering the network device, the purchaser and the managing
15 means in accordance with any one of the so-called SET and SSL protocols for electronic recharge via the so-called Internet.
7. The method as claimed in claim 2 wherein the step of transmitting data is supported by a step of making payment by one of the methods of payment selected from the group consisting of cash

payment, bank card payment and pre-registered banking account relationship.

8. The method as claimed in claim 2 including a preliminary step of providing the computerised managing means with a stock of
5 Personal Identity Numbers ("PIN"s) as reference detail for the pre-paid values.
9. The method as claimed in claim 1 wherein the pre-paid values are pre-paid cellular airtime.
10. A network device for use in a method for vending, distributing ,
10 recharging and/or replenishing pre-paid values electronically as claimed in claim 1, the network device comprising a vending machine having a traditional computer driven electronic display monitor;
a traditional computer driven printer;
15 a keyboard, capable of capturing security codes from purchasers in support of banking cards;
note acceptor means for optically recognizing bank notes and determining the monetary value thereof;
processing means for electronically driving the hardware and

software incorporated in the vending machine required to facilitate the processing of an electronic transaction; and card reader means for reading the magnetic strip of banking cards to be used for providing payment and computer chips.

5

11. An electronic system for use in a method for vending, distributing, recharging and/or replenishing pre-paid value electronically as claimed in claim 1, the system comprising a network device;

10

an electronic network, including at least one of the digital communication facilities presently available such as radio, satellite and landline telecommunication;

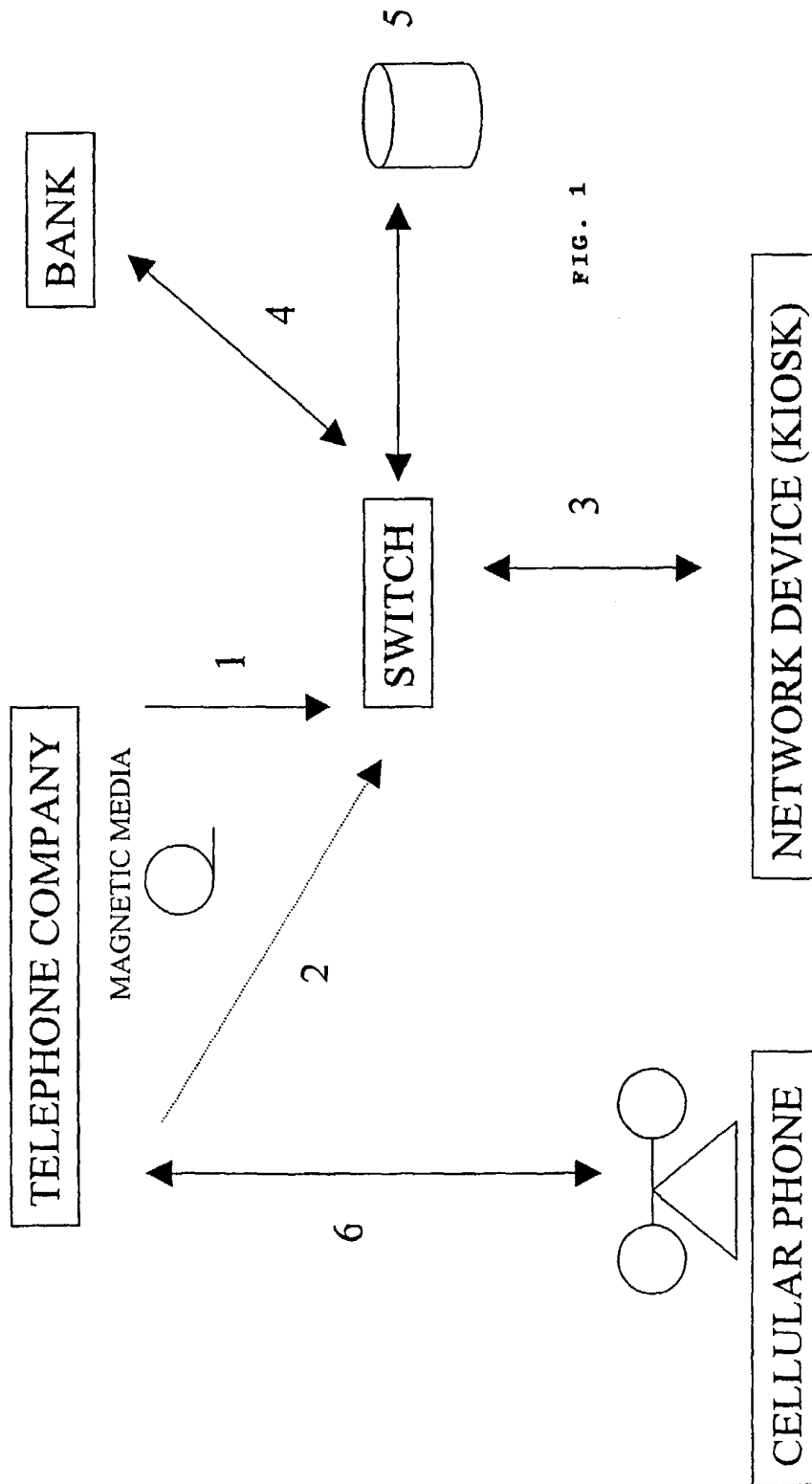
computerised managing means for electronically managing the network, PIN storage and transfer, data distribution, financial procedures and security procedures; and

15

an independent financial institution for electronically distributing, managing and collecting funds.

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ELECTRONIC SALE OF PREPAID



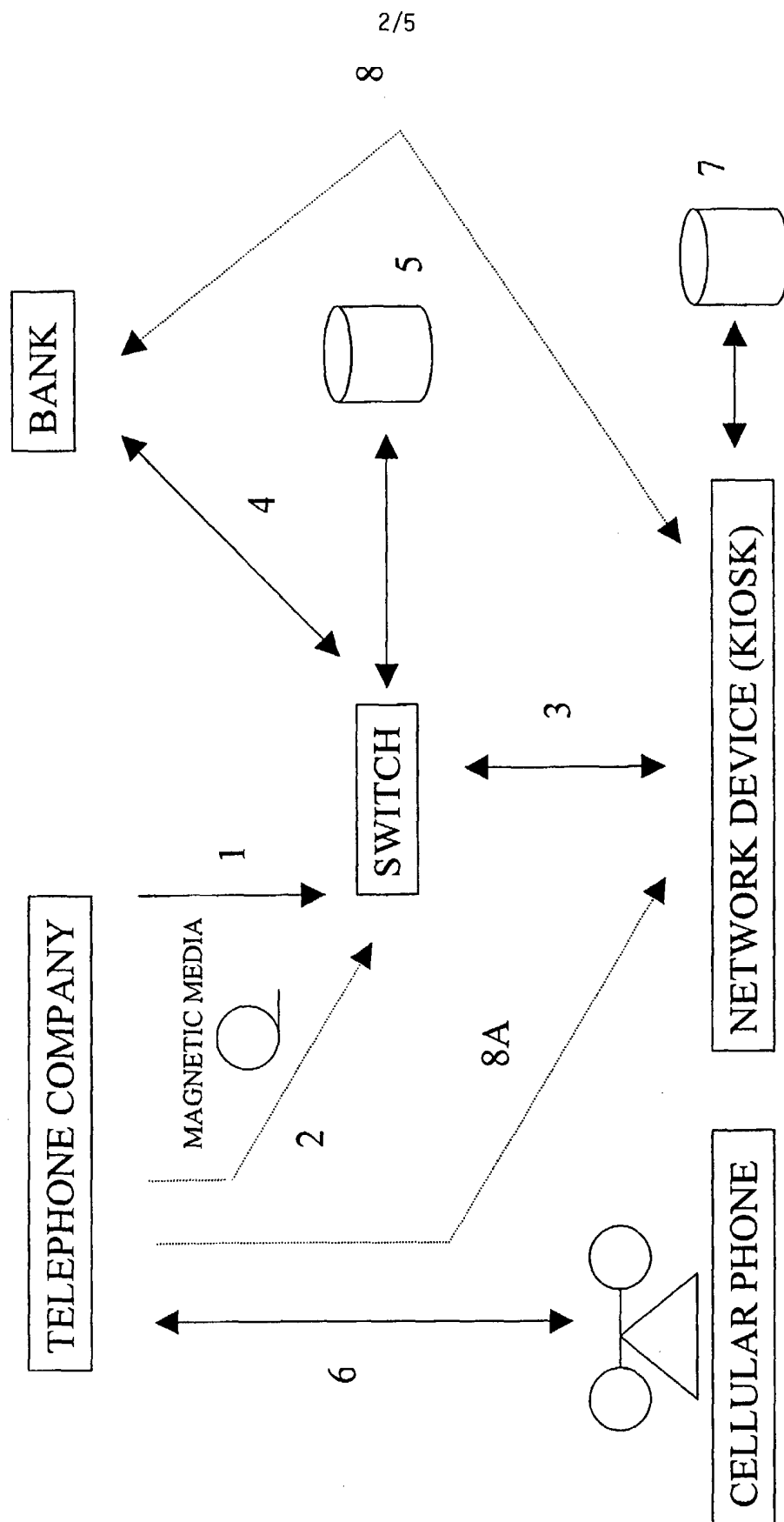
ELECTRONIC DISTRIBUTION

FIG. 2

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ELECTRONIC RECHARGE

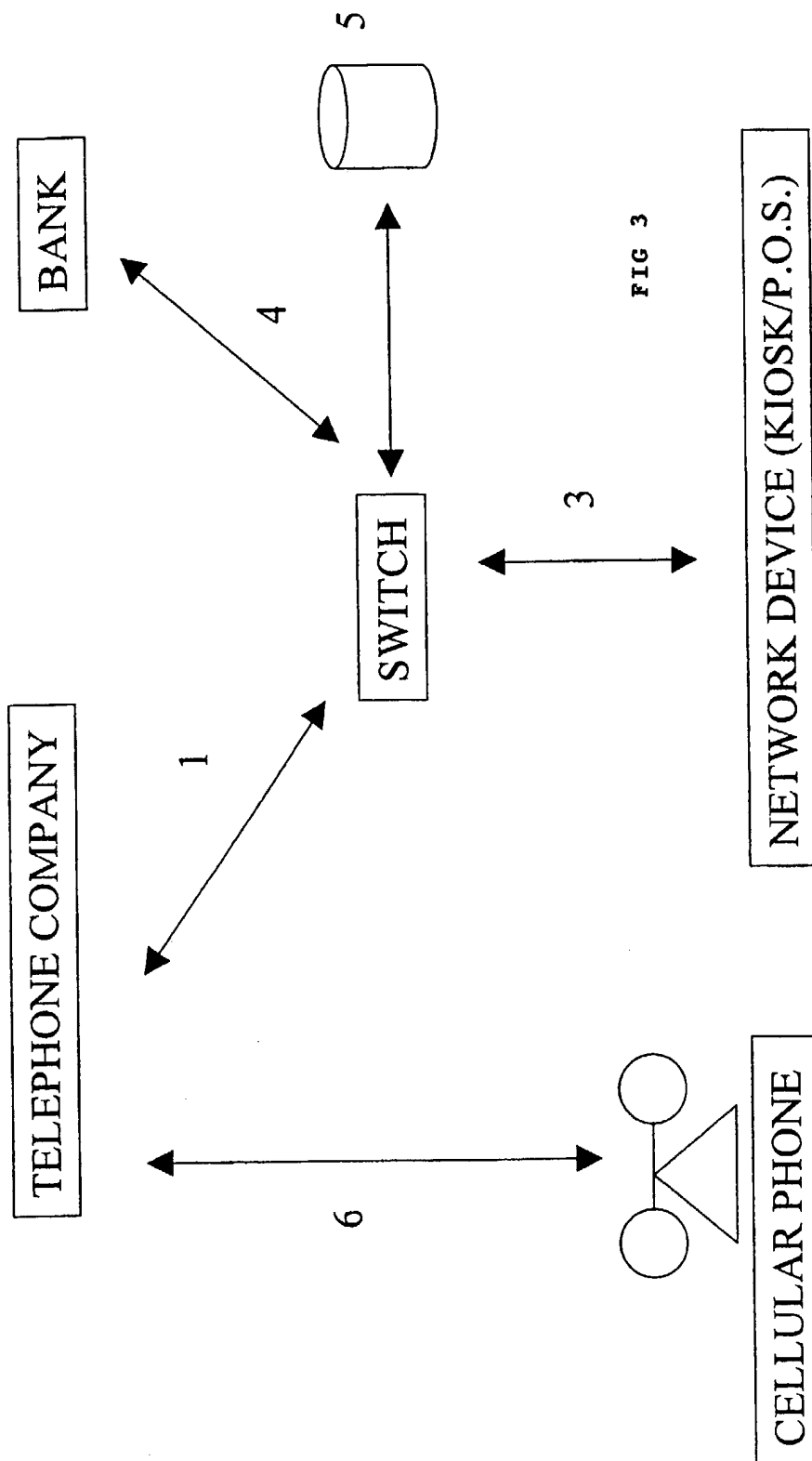


FIG 3

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CHIP CARD REPLENISHMENT

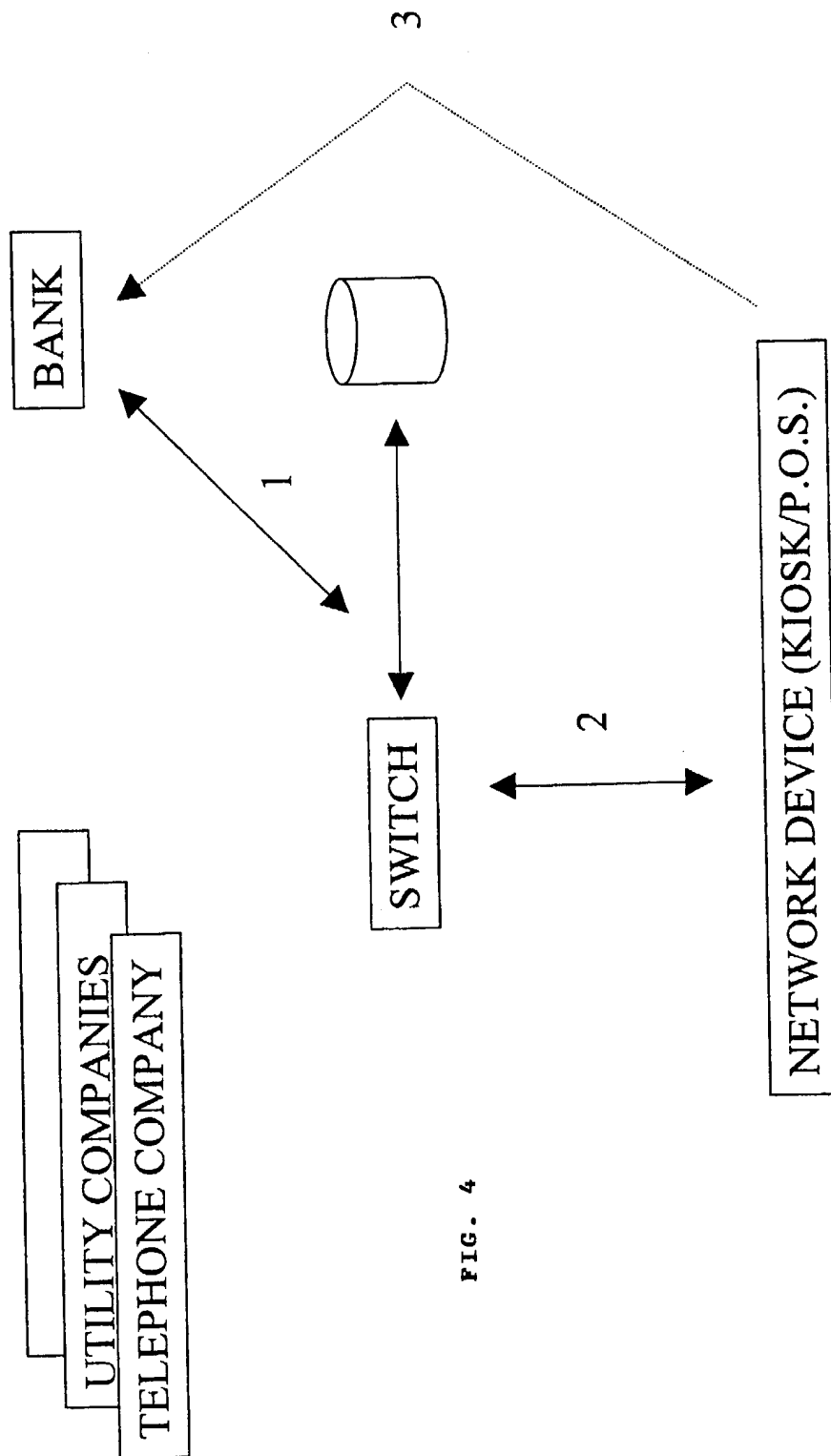


FIG. 4

ELECTRONIC SALE/RECHARGE VIA INTERNET

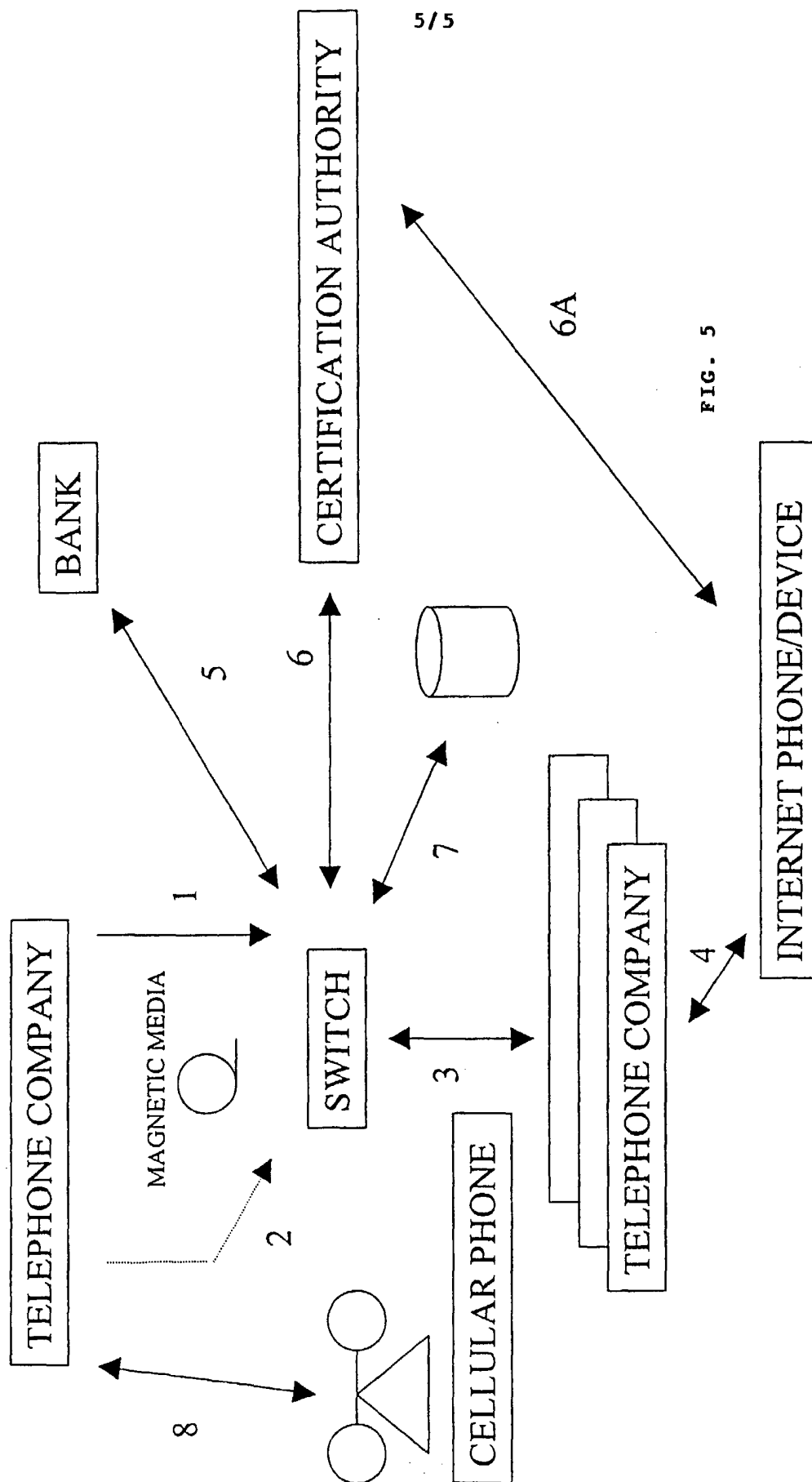


FIG. 5

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 98/01096

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 G07F17/16 G07F7/08

According to International Patent Classification(IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 G07F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	WO 96 41462 A (ELECTRONIC DATA SYST CORP) 19 December 1996 see abstract see page 2, line 20 - page 3, line 35 see page 6 see page 19, line 11 - page 20, line 10 see figures 1,4	1,2,7,8, 11 3,10
X A	US 5 577 109 A (STIMSON CHARLES J ET AL) 19 November 1996 see column 2, line 1 - column 3, line 21 see column 5, line 65 - column 7, line 51 see figures 1,4	1,2,7, 10,11 3,8
A	EP 0 380 377 A (URBA 2000) 1 August 1990 see column 8, line 31 - column 9, line 35 see figure 1	1-4,7

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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Date of the actual completion of the international search

23 July 1998

Date of mailing of the international search report

03/08/1998

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Bocage, S

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 98/01096

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